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We must first note that the lungs are considered by some as the most important or vital of all the organs of the body. The great Bichat, in his immortal *Recherches sur la Vie et la Mort,* states that the lungs, the heart, and the brain are the *tripod of life*, with a leaning toward the greater importance of the lungs. Those who have visited the Orfila Museum of Anatomy in Paris must have been impressed by the grand lifesize statue of Bichat at the foot of the stairs leading to the museum. It symbolizes the *Recherches sur la Vie et la Mort.* It represents Bichat bending slightly over a youth that is standing. His lofty brow and fine features are set as if listening to the whisperings of his inspiring genius, ready to write them down with the pencil he holds in his right hand. There is a shade of the irony of fate in the fact that the sublime extoller of the lungs was afflicted with tuberculosis of the lungs. He died at the age of thirty-three, leaving the scientific world filled with his glorious name. It is equally worthy of notice that the illustrious Laënnec, who carried the auscultation of the lungs to such a marvelous perfection, died of tuberculosis, contracted, it is said, in the autopsy room.

We must remember that the lungs are the only organs that contain air. It is noteworthy that they are never entirely empty of air, nor is the heart of blood. It is notable that the lungs are the most frequently diseased of all the organs. The dictionary says that *lung* means *light,* not heavy. I

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am told that butchers and the common people call the lungs the *lights*. We should remember that the lungs belong to the group of organs that have lobes like the brain, thyroid, thymus, liver. We should also take notice that they belong to the class of double organs, like the salivary glands, suprarenal capsules, kidneys, ureters, seminal vesicles, testicles, Cowper's glands, ovaries, Fallopian tubes. It is a fact to be noted that they are asymmetrical organs, the only double organs to present this peculiarity.

We should remark that the two lungs almost fill the whole chest, i. e., occupying one good third of the trunk cavity. The two occupy more space in the body than any other organ or organs. We should lay some stress upon the difference in size of the two lungs. The right is somewhat larger than the left, although it is shorter, owing to the encroachment of the liver into the right chest; yet the left lung is narrower because of the encroachment of the heart upon it. It is worthy of notice that the axes of the lungs are directed vertically, like the suprarenal capsules and the kidneys. It is to be noted that the lungs are free all over their surface except at the very small point of the hilum. The spleen and the kidneys are the only other organs presenting this feature. A special note should be made of the mobility of the lungs. They expand and contract rhythmically. The heart is the only other organ presenting the peculiarity of expansion. A notable point is that the lungs impart passive motion to the chest walls, but they receive no extrinsic movement. It should be remarked that they follow the chest walls during respiration, and are constantly in contact with them. It is worthy of more than passing notice that from the first breath of life at birth to the last parting gasp, the lungs never rest. Neither does the heart. Both are the only two organs that never sleep.

We must call attention to the shape of the lungs. They are irregularly conical, the irregularity consisting in the concavity of their inner surface to accommodate the heart and in the excavation of their base to fit the convexity of the diaphragm. It is remarkable how extensive is the external or convex surface of each lung. This is unique, the liver being the next organ presenting an extensive surface. Another characteristic feature is also presented by that surface in the interlobar fissures. This is for the purpose of facilitating the expansion movements of the lungs. We must observe that the left lung has only two fissures, whereas the right has three. The reason for this is that the right lung is more compact, is broader than the left, which is longer and more slender. These fissures are found in no other organ. The brain presents the Sylvian fissure, but there is no motion between the surfaces of the fissure and the arachnoid bridges over it, whereas in the case of the interlobar fissures the pleura dips in between the lobes so as to facilitate the gliding movement between the lobes.

We must note especially the peculiar gray color of the surface of the lungs in the adult, together with the black pigment strewn all over it. Their color and pigment are unique, being seen in no other organ. We will also call attention to the faint lines marking the base of the superficial lobules, lines so much better marked in the fetus and child. The surgeon is interested in remembering that the whole of that surface is accessible through the intercostal spaces.

It is to be particularly mentioned that the internal surface of the lungs is much more complex than the outer one. First, we should note that it is much more limited; next, that it is concave. Then the hilum is the most typical of all the hilums. It is peculiar that it is the only point where the lungs are bound, being free all over. It is a feature that that part of the lung in front of the hilum corresponds to the pericardium and heart, and that part which is behind it to the posterior mediastinum; finally, that the part above it limits the superior mediastinum. Special attention should be called to the under surface of the lung, commonly called its base. It is the only organ presenting such an excavated or concave surface. The base of the suprarenal capsules is also concave, .but it is very insignificant compared to this one. The concavity is to accommodate the convexity of the diaphragm. It is to be borne in mind that it is more marked in the right lung, because of the greater bulging of the liver into the chest. A point of interest is that very relation of the liver with the lung, explaining how abscesses of the liver may discharge into the lungs and bronchi. We must insist particularly on the bulging of the apex of the lung into the supraclavicular region, beyond the border of the first rib, which makes an indentation in it. This presence of the lung in the space mentioned above, is a fact that surgeons must not forget in operating there. There is no organ, except the liver, that presents such a broad and extensive posterior border. It is truly a surface. Together with the external surface it presents a remarkably extensive area for stethoscopic examination.

There is quite a contrast between the anterior and the posterior borders. The former is short, thin, slightly sinuous, and festooned; recalling somewhat the anterior border of the liver. There is no parallel anywhere to the inferior border, the one which circumscribes the base. We must lay stress on its thinness and sharpness, which fits it to come down into the inferior or diaphragmatic cul-de-sac, during inspiration, especially a deep one. The descent and ascent of that sharp edge during respiration explains how there may be a penetrating wound of the chest and pleura without penetration of the lung if the injury is inflicted there during expiration, when the lung has receded from the cul-de-sac.

The color of the lungs is *sui generis;* its pigmented appearance is without an equal anywhere. It is worth noticing that the pigment does not exist in infancy and that it comes on and extends as the subjects advance in life. It is interesting to remember that it is said to be due to particles of dust and coal absorbed from the atmosphere and incorporated into the lung tissue.

Again, the consistency of the lungs is unlike that of any other organ. Its soft and downy sensation is unique and characteristic. It is due to the presence of air in the vesicles. Another unique and characteristic trait is that upon pressing the lung tissue between the fingers there will be felt a sensation of fine crepitation. It is said to be due to the passage of fine bubbles through the liquid contained in the vesicles, or the rupture of the walls of the vesicles by the air under the pressure. It is extraordinary how small is the density of the lungs. It excels all the other organs in that respect. It will float almost entirely when put in water, whereas all the other organs will sink below the surface when thrown into a bucket of water. Of course, that is due to the air in the vesicles which cannot be entirely expelled in spite of all efforts, whereas the gas in the stomach and intestines can be removed entirely, and the organs made to sink. We should lay some emphasis on the little friability of the lungs. The thumb nail penetrates them with difficulty; they are the toughest of all organs; they do not tear easily. All this is due to the character and nature of the tissues entering into their composition. That toughness, which cooking will not overcome, is the reason the lungs are not used for human food. They are the only solid organs that are not eaten by man. However, they are fed to cats, very likely because they are cheap, not being eaten by human beings, and may be cats eat them because they can get no other food. We must take special notice of the elasticity of the lungs. It is without an equal. No other structure will stretch like them. It is also wonderful how retractile they are, coming down immediately after having been inflated. That is due to the large amount of elastic tissue entering into their composition. That retractility was also necessary for the proper function of the lungs.

A notable exception from the structure of other internal organs is the absence of a regular, distinct, fibrous envelope under the endothelial layer. We find there no membrane, ever so thin, that can be peeled off like the one enveloping the kidney and the liver. This may be due to the excessive amount of fibrous tissue entering into the structure of the lungs; it is densely packed and flattened on the surface, and renders a separate envelope unnecessary. We must admire the simplicity of the formation of the pulmonary lobules by the dilatation of the terminal inner surface of the hollow lobules of the depressions or alveoles called the air vesicles, to increase the surface of action. The whole recalls the lobule of the racemose glands, the air vesicles representing the acini and lobule, and the capillary bronchi the initial excretory duct. It deserves noting that a whole frog's lung represents a whole lobule of a human lung. The greatest characteristic of the structure of the lungs is the immense amount of fibrous and elastic tissue that enters into their formation. There is so little of all the other highly organized tissues that they may be ignored. However, we cannot let pass the smooth, muscular fibres found in the capillary bronchi, where they seem to play the same rôle they do in the vascular capillaries. Two facts worthy of more than passing notice are the presence of a ciliated epithelium in the bronchi, and the fact that the epithelial cells, constituting the lining of the air vesicles, are deprived of nuclei. For this reason they are by some called epithelial plates. The absence of the nucleus is to leave as little as possible of substance between the air in the vesicles and the blood in the capillaries.

The circulation of the lungs is most interesting in that it presents two separate circuits or circulations, the pulmonary and the bronchial. The liver presents a dual arterial circulation, represented by the hepatic artery and the arterial or intrahepatic portion of the portal system, but there is only one set of veins, the hepatic veins; whereas in the lungs we have a pulmonary artery with the pulmonary veins and the bronchial arteries with their satellite veins. We should be impressed by the large size of the pulmonary artery, larger in its initial portion than the aorta itself, as it has more blood to transmit at any one time than the aorta has at any one time. Its origin from the heart is without example; it comes from the infundibulum of the right ventricle and seems truly a prolongation of it, quite different from the abrupt origin of the aorta from the left ventricle. Let us note that the presence of this infundibulum or funnel of the right ventricle is to facilitate the flow of the blood into the artery, thus requiring less force from the ventricle. This because the right ventricle has weaker walls and driving power than the left, and has to drive a larger amount of blood at a given time than the left ventricle. We must make special mention of the presence of the semilunar valves at the orifice of the pulmonary artery. These valves have no duplicates anywhere except in the aorta. Why are they pocket shaped? We must remember that the valves of the pulmonary artery are not as thick as the aortic valves, because they have not to resist such a long column of pressure. It is a most striking fact that there are no valves at the orifices of the two cava veins and the four pulmonary veins. This is because the pulmonary artery, the aorta, and the great coronary vein are connected with the base of the ventricles, which are almost entirely fibrous, presenting no muscular, sphincterlike fibres around their orifices, as we find in the case of the two cava veins and the four pulmonary veins. These fibres close these orifices as soon as the auricles start to contract; therefore no valves were needed there.

The course of the pulmonary artery is special and unique in that it is at first anterior to the aorta, then winds around it, and finally is under it. The two vessels twist or interlock like the two bent index fingers placed one under the other, the right over the left. There is no other such vessel winding around another in such manner. It is not to be forgotten that the remnants of the arterial duct of Arantius are almost always found in the adult. We should make the special point that the right branch of the pulmonary artery divides into three divisions, whereas the left divides only into two. because the right lung has three lobes, against the left's two. But it is the terminal capillaries of the pulmonary artery that call for admiration of the wisdom of the Maker. We should remember that they form three capillary plexuses, one around each lobule, a second one in the partition between the air vesicles, and a third one beneath the epithelium. All this for the purpose of breaking the force of the heart's impulse and preventing the rupture of the capillaries, whose walls are reduced to the very minimum of thinness so as to have as little intervening tissue between the blood in the capillaries and the air in the air vesicles.

We must take note that although there is but one pulmonary artery there are four pulmonary veins; but we must see the point that each vein is much smaller and that the four are not as large as the artery, since the blood in passing through the lungs has lost some of its bulk. We must also remark that there are only two right pulmonary veins, whereas the artery has three divisions in the right lung. It is very remarkable that the orifices of the pulmonary veins have no valves to prevent the reflux of the blood when the auricle contracts. The cause for this is that when the auricles contract they contract from the periphery to the centre, and their first action is to close the sphincterlike fibres placed at the orifice of the pulmonary veins. Last, but not least, we must not lose sight of the fact that the pulmonary veins carry a purer blood than the artery because of the depurative action undergone by the blood in passing through the lungs. With regard to the bronchial arteries we must be struck by their very small size as compared to the large organs to which they are distributed. The explanation for this is that they are simply the nutrient arteries of the lungs and that the lungs are composed of tissues which require very little nutrition. Besides, it is most remarkable that the amount of solid tissue in the lung is quite small. When a lung has been compressed against the mediastinum by thoracic effusion continued long enough to expel all the air, the large lung is often reduced to the dimensions of the hand, in thickness, length, and breadth. It is to be noticed that the bronchial artery, being only a nutrient artery, the capillaries of this reaching the lobules and the air vesicles, do not share the provision of nature in the thinning down of their walls and reaching the subepithelial spaces, so that they do not participate in the process of osmosis. We must make a note that the bronchial veins do not discharge into the auricles, but into the innominate veins or one of the afferent branches.

Let us remember that the lymphatic glands, into which the lymphatic vessels of the lungs discharge, are located at the bifurcation of the trachea, so that when they are much enlarged they contribute to the distress of the breathing by compressing the bronchi. It is thoroughly out of the ordinary that these glands should be of a black color, due to the transmission through the lymphatics of the coloring matter found in the lungs. It is quite a remarkable fact that the lungs receive no single special nerve. The nerve supply is abundant, but comes from a plexus, the bronchopulmonary. This arrangement is the same as for all the organs of vegetable life. None receive a large nerve directly, but get their supply through plexuses. The liver, receiving the right pneumogastric nerve, is the only exception. We must note especially that the lungs present in their chemical composition less of the highly nitrogenous compounds than any of the other organs, except perhaps the cartilages.

It is to be remembered that during fetal life the lungs are solid organs, and as such they will sink in water. This is a capital sign in medical jurisprudence, because it is positive proof that in case of infanticide the child was killed before it breathed, whereas when the lungs float it is a sure sign that death occurred after the child had breathed. We should make a note that this test is called the pulmonary docimasia. We must recall here that another remarkable feature during fetal life is that through the arterial duct of Arantius, the bulk of the blood from the right ventricle evades the lungs and goes directly into the aorta. The reason of this is that the lungs are passive and inactive in fetal life. Only enough blood is allowed to get through them to keep, as it were, the machinery in working order, ready for the big work that is coming. With the first breath the lungs fill with air, and from that moment they never cease to act until death. We must bear in mind that after birth the arterial duct becomes obliterated because all the blood goes to the lungs and ceases to pass through the duct. We must lay special stress on the fact that during fetal life and infancy the lungs have a pink color and the outlines of the base of the superficial lobules are well marked, owing to the greater quantity of connective tissue. But after adolescence the lungs begin to become gray, then pigmented, while the outlines of the lobules become less distinct from the absorption of the greater abundance of connective tissue observed in the fetus. All these things increase with age. It is to be noted especially that in men working in the coal mines the lungs often become very black, even presenting coal dust calculi or deposits. It is the anthracosis of miners.